Wind Tunnel Design for Lunar Dust Filtration Tests

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Overview

NASA's vision is to eventually establish human stations on the Moon. The additional loading of lunar dust will challenge future exploration filtration systems and NASA is concerned about the safety of crew members as they conduct lunar missions. A filtration testing facility is being set up to test filters and filtration concepts for the removal of lunar dust particles.

Lunar Dust

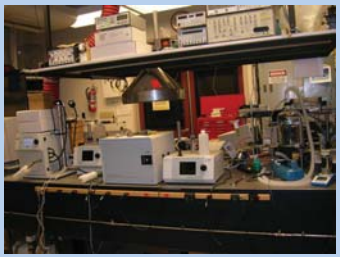
- Fine and ultra fine particles
- Abrasive
- Inhalation causes biological problems
- Causes increased level of maintenance and mission risk

Astronaut Gene Cernan covered in lunar dust.

Particle Detectors

TSI Inc.

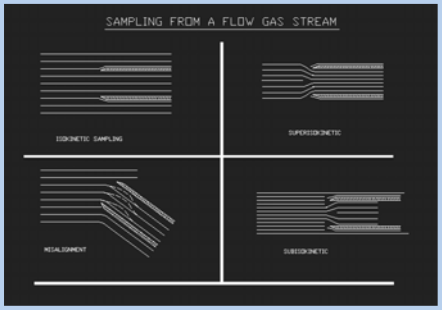
- Aerodynamic particle sizer (APS) < 0.5 µm
- Scanning Mobility Particle Sizer (SMPS) 2.5 to 1000 µm also contains water-based Condensation particle counter 10 to 20 nm



Current lab setup.

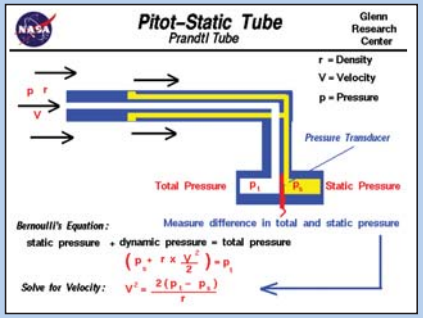
Sampling Probe

Isokinetic Sampling—The rate at which the dust is collected is the same as the surrounding air flow.



Flow Sensors

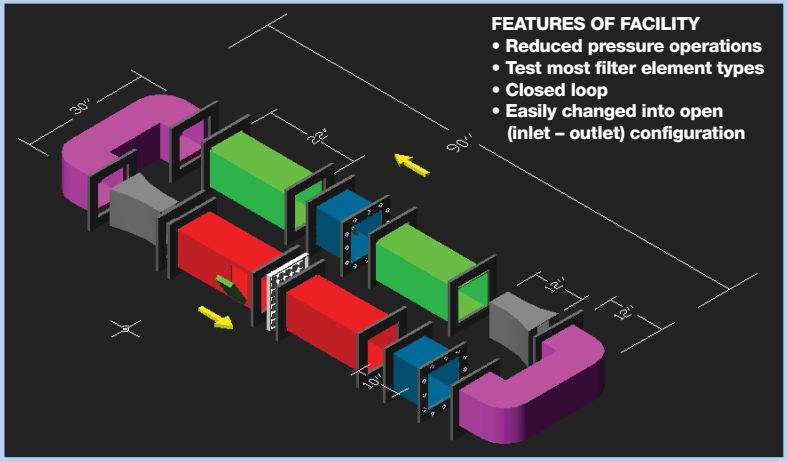
- Pressure transducer
- Pitot tube—used to measure static and dynamic pressure within the duct
- Hotwire—measures flow parameters



From Pitot data, scientist can derive velocity values and adjust pressure.

My Contribution

- Designed CAD drawings of wind tunnel
- Drawings will be used to layout the probe placements and initial dimensional sizing
- Contacted several distribution companies to purchase sensor systems



Filtration Standards

Following the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) 52.2 Standards.

Acknowledgments
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